REMARKS

Claims 1, 4, 5, 7-21, 24-31 and 33-46 are in this application and are presented for consideration. Claims 1, 4, 5,16, 18, 21, 24-31 and 33-44 have been amended, and new claims 45 and 46 have been added.

The specification and claims have been amended to address the Examiner's objections, incorporate the Examiner's suggestions and to place the application in better form. The claims have also been amended to further highlight and more clearly point out the important features of the invention.

The independent claims have been rejected as being anticipated by Grainger 'US 2001/0035729 A1.

With this amendment new independent claim 45 has been added. Claim 45 sets forth a method for controlling a plurality of manipulators where each manipulator has a control unit. Each control unit has a high priority area and a low priority area for processing control signals. In the specification, and in figure 2, the control units 2.1-2.4 are described as being divided into a real-time area and a non-real-time area, page 12 third paragraph. The high priority area of claim 45 is the real-time area, and the low priority area is the non-real-time area. It is well known in the art of computational processing, or computer science, that real-time processing has a higher priority than non-real-time processing. In particular real-time processing must be performed before a deadline and as soon as possible, while non-real-time processing does not have a deadline and are interruptible . Therefore real-time areas process instructions or signals with a higher priority than non-real-time areas.

Claim 45 also sets forth an operating device, which in the drawings is represented by reference 6. The operating device generates control signals and sends the control signals to the control units. Claim 45 sets forth the step of dividing these control signals into motion-relevant control signals and non-motion-relevant control signals. The motion-relevant control signals are sent to the high priority area of the control units, and the non-motion-relevant control signals are sent to the low priority area of the control units.

Applicant has reviewed US 2001/0035729 A1 and finds no teaching nor suggestion of a control unit with a high priority area and a low priority area, or of separating control signals into motion-relevant control signals and non-motion-relevant control signals. Likewise, there is no teaching nor suggestion of sending motion-relevant control signals to a high priority area and sending non-motion-relevant control signals to a low priority area. Therefore US 2001/0035729 A1 does not anticipate all the features of new claim 45. Claim 45 therefore defines over US 2001/0035729 A1.

Claim 1 has been amended to set forth that the operating device generates movement-relevant control signals and non-movement-relevant control signals. Amended claim 1 also sets forth that the control unit has an area designed to process the motion-relevant control signals in real-time, and an area designed for non-real-time processing. Applicants review of US 2001/0035729 A1 finds no teaching nor suggestion of a control unit having an area for real-time processing, and another area for non-real-time processing. Likewise, applicant finds no step in US 2001/0035729 A1 of sending motion-relevant control signals to a real-time area and non-movement-relevant control signals to a non-real-time area. Claim 1 therefore also defines over

US 2001/0035729 A1.

Independent claim 21 has also been amended to set forth a real-time area and a non-real-time area in the control units. As described above, US 2001/0035729 A1 does not teach nor suggest a control unit with a real-time area and a non-real-time area. Therefore claim 21 also defines over US 2001/0035729 A1.

Grainger US 2001/0035729 A1, which we believe to be the closest state of the art, appears to pertain to:

> a process for controlling a plurality of manipulating devices with a number of control units, which are associated with the manipulating devices, so that each control unit controls at least one manipulating device, wherein a portable operating device accesses a plurality of control units for controlling the manipulating devices,
>
> and to a
>
> device for controlling a plurality of manipulating devices, with a plurality of control units, which are associated with the manipulating devices, so that each control unit controls at least one manipulating device, and with a common portable operating device for operating the manipulating devices, which can be connected to at least one certain control unit.

US 2001/0035729 A1 pertains, just as a part of the present application, to the establishment of connections between a mobile, especially portable operating device and one of several control units for a machine or a robot each. The operating device of US 2001/0035729 A1 is designed now such that motion sequences are programmed. The user can

use motion patterns prepared in advance, which are stored in the memory of the control unit. The programming of the motion patterns is noncritical in terms of time and no statement is thus made concerning a time-critical nature, either.

By contrast, the basic object of the present invention is to perfect a process of this class and a device of this class such that not only preprogramming is possible in control units of manipulating devices, but rather the operation of a greater number of manipulating devices (via the control devices thereof) is possible as well with a targeted selection of a certain requirement among the requirements necessary for such a direct operation (real time), without other communication operations interfering in a hindering manner.

The task mentioned is accomplished according to the present invention in a process such that:

> motion-relevant control signals that are generated by the operating device and are directly suitable for a motion control of the manipulating devices in question are passed on via a first transmission means in real time to an area of the associated control unit, which area is designed for processing motion-relevant control signals in real time, and that non-motion-relevant control signals are passed on via a second transmission means to an area of the associated control unit that is designed for the non-real-time processing of data.

To accomplish this, a device of this class provides for

> the control units to have areas set up for executing a real-time-capable operating system and a non-real-time-capable operating system; for the operating device to be designed

for operating the manipulating devices in real time; for real-time-capable areas of the control units to be designed for processing motion-relevant control signals, which are received from the operating device and are directly suitable for the motion control of the manipulating devices in question; for the operating device to be designed for generating non-motion-relevant control signals; and for the control units to have areas for the non-real-time processing of non-motion-relevant control signals generated by the operating device.

The present invention also makes provisions for the transmission, via common control lines, not only of control-relevant signals meeting real time requirements and of non-control-relevant signals, which are not subject to any real time requirements, but, moreover, also for the control units of the manipulating devices to be designed for the separate processing of the different types of signals and for processing the different types of signals, which are different in terms of the process, in separate areas.

The newly amended and submitted claims, which have only been complemented compared to the claims submitted most recently on July 7, 2005, are indisputably novel.

WO 01/67190 A2 pertains to a control process and an industrial production means, wherein the control takes place via an Internet protocol. Robots are controlled here via a network, which connects the robots to the corresponding control units. How the operating device present there is associated with the corresponding robot or the control unit thereof is not stated in the document. However, it is stated that the control takes place in application-related real time. No data can be found in the document concerning the further processing of the

signals in the control means associated with the individual robots, and, in particular, it is not mentioned how motion-relevant signals or data are separated from non-motion-relevant signals and data within the control units. The control units are also not divided, in the manner being claimed according to the present invention, into real-time-capable and non-real-time-capable areas. Therefore the claims also define over this document.

As was stated, the independent claims contain, as a new feature compared to the state of the art according to US 2001/0035729 A1, which was cited for distinction, essentially that the control signals generated by the operating device are distinguished according to their property of whether they are motion-relevant or not, and they are accordingly transmitted to the manipulating devices via different transmission means, the motion-relevant signals being transmitted in real time.

The other prior-art references cited in the Office Action also fail to show these features.

The reference "Microsoft Press Computer Dictionary" was mentioned only concerning the image compression mentioned on page 45.

This itself is not the subject of the amended independent claims 1 and 21. The reference "Microsoft Press Computer Dictionary" makes no statement in connection with the features of claims 1 and 21 not known from US 2001/0035729 A1.

The US patent 6,697,681 B1 (Stoddard) discloses a device on a network having multiple units of programmable industrial equipment, including a control handle connected to a controller for a unit of the programmable equipment and a shared operating unit selectively connected to the control handle for controlling the unit of programmable industrial equipment

through the controller. Further, the shared operating unit is adapted to connect to the network for communicating with each unit of programmable equipment on the network.

This document was cited first in connection with claim 16 concerning the features "the transmission of movement-relevant signals via the first transmitting device is controlled by a first monitoring device and in the case of an interruption of transmission a movement-relevant control signal is generated by said monitoring device." The document was cited, furthermore, as a prior-art reference in connection with claim 18 in the respect to the feature "the image information data and control signals generated by the operating device are transmitted on different channels being controlled by a second ... monitoring device."

Stoddard does not show the above-mentioned essential feature of splitting the transmitted control signals into motion-relevant and non-motion-relevant signals, nor the partial feature of the real-time-capable transmission of the motion-relevant features.

US 6,922,611 B2 (Lapham) pertains to an automation equipment control system comprising a general purpose computer with a general purpose operating system in electronic communication with a real-time computer subsystem. The general purpose computer includes a program execution module to selectively start and stop processing of a program of equipment instructions and to generate a plurality of move commands. The real-time computer subsystem includes a move command data buffer for storing the plurality of move commands, a move module linked to the data buffer for sequentially processing the moves and calculating a required position for a mechanical joint. The real-time computer subsystem also includes a dynamic control algorithm in software communication with the move module to repeatedly

calculate a required actuator activation signal from a joint position feedback signal.

This document pertains only to the computer or control systems themselves and the connection thereof to the robot 204A or the manipulating system 204B and the actuation of the motors of these devices. The document does not pertain to operating units or manipulating devices for actuating the control or computer systems.

A real-time-capable computer system, for example, with the drive motors for moving the arms of the robot, communicates via a path or channel, and with an end effector via another path or channel, and it may be besides the point whether this communication takes place in real time or non-real-time.

This has nothing to do with the idea according to the present invention of communication between the manipulating device (which is not mentioned in Lapham at all) and the control or computer system and the separation of the signals exchanged between the manipulating device and the control system. US 6,922,611 B2 (Lapham) makes no statements about this and therefore it also cannot suggest all the features of claim 1 to the person skilled in the art.

DE 101 47 432 A1 was cited in connection with claim 22, and discloses a process and an electronic circuit for a scalable communication interface between a first communication connection with a first transmission cycle of a first length and a second communication connection with a second transmission cycle of a second length, with a reception list for the first transmission cycle and with a transmission list for the second transmission cycle, where a data telegram received according to the reception list is assigned to an element of the transmission

list.

Thus, only a division concerning reception and transmission is mentioned here, but a division concerning control signals of different qualities or different application levels, regardless of their direction, is not.

As far as element 41 "drive" is concerned, it is a drive motor in connection with the associated electrical system, especially a high-voltage electrical system; this has nothing to do with a control device or with a control unit (control device) in the form of, for example, a computer or the like. The control device is rather the element in Figure 5. Even though the subject of this document with an Isochronous Real-Time Ethernet (IRTE), the distinction between "fast" and "slow" has nothing to do here with the fact that the "fast" data are real-time data and the "slow" data are non-real-time data, but only fast and slow cycles that are synchronous with one another are designated hereby (column 3, line 50). This document also pertains only to the data connections between the control device 45 (control device) and the drive (s-motor) 41 of a moving part of an automation system (column 1, line 5), but not to the communication or connection between a manipulating device (operating device for controlling a plurality of manipulators) and the control units associated with the manipulators or robots.

Therefore, DE 101 47 432 A1 was also unable to offer any suggestion to the person skilled in the art and to suggest to him to further develop the subject of US 2001/0035729 A1 in the manner according to the present invention.

If the Examiner has any comments or suggestions which would further favorable prosecution of this application, the Examiner is invited to contact applicant's representative by

telephone to discuss possible changes.

At this time applicant respectfully requests reconsideration of this application, and based on the above amendments and remarks, respectfully solicits allowance of this application.

Favorable action on the merits of this application is respectfully requested.

Respectfully submitted
for Applicant,

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SHOULD ANY OTHER FEE BE REQUIRED, THE PATENT AND TRADEMARK OFFICE IS HEREBY REQUESTED TO CHARGE SUCH FEE TO OUR DEPOSIT ACCOUNT 13-0410.